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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/055,580	01/22/2002	Jin-Yuan Lee	JCLA8676	6089

7590 03/23/2005  
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EXAMINER

MITCHELL, JAMES M

ART UNIT PAPER NUMBER

2813

DATE MAILED: 03/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

**Office Action Summary**

Application No.

10/055,580

Applicant(s)

LEE ET AL.

Examiner

James M. Mitchell

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 November 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 78-83, 85 and 87-91 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 78-83, 85 and 87-91 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

1. This office action is in response to the request for reconsideration filed November 15, 2004.

#### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claim 78, 81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura (U.S. 6,706,554) in combination with Burnette et al. (U.S. 6,552,436).
4. Ogura (Fig 1H, 2A) discloses (cl. 78) a bonding structure (26) positioned on a pad (14) of a chip (10), wherein the bonding structure is adapted to be bonded on a pad (36) of a substrate (32), the bonding structure comprising: a conductive pillar (22) positioned over the pad (14) of the chip; and a solder cap (26) positioned over the conductive pillar, and a largest transverse dimension of the solder cap is smaller than a transverse dimension of the conductive pillar, wherein the solder cap is formed over the conductive pillar before the solder cap is bonded to a pad of the substrate; (cl. 81) with the pillar gold (Col. 4, Lines 60-63).
5. Ogura further disclose bonding the its solder cap to a pad s, such that its cap has a smaller transverse than the transverse of its pad, but does not appear to show that the substrate has a patterned solder mask with at least one opening that exposes the pad,

or wherein the solder cap has a largest transverse dimension smaller than a transverse dimension of the opening in the patterned solder mask.

6. Burnette (Fig. 2) teaches use of a patterned solder mask with openings exposing a pad, such that the opening is larger than the pad.

It would have been obvious to one of ordinary skill in the art to incorporate a patterned solder mask with openings exposing the pad of Ogura, such that its transverse of the solder cap is smaller than the traverse of its opening in the mask, in order to prevent solder over areas not wanted as taught by Burnette (Col. 1, Lines 46-49).

7. Claim 79, 80, 85, 87, 88 and 91 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura (U.S. 6,706,554) and Burnette et al. (U.S. 6,552,436) as applied to claim 78 and further in combination with Miyazaki (U.S. 2001/0048166).

8. The modified structure of Ogura and Burnette discloses the elements stated in paragraphs 4-6 of this office action and further a transition layer (i.e. bond layer between solder and pillar), but do not disclose that the pillar is either copper or tin-lead. However the prior art discloses the same invention except that conductive pillar is made of for example gold instead of either copper or tin-lead,

9. Miyazaki shows that pillars comprising copper, gold and tin-lead are equivalent structures known in the art known (Par. 0050, CIM 8 of Miyaki). Therefore, because these compositions are art recognized equivalents for forming pillars at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute either copper or tin-lead (likewise evidenced by applicant's claim 81),

10. Claims 82 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura (U.S. 6,706,554) and Burnette et al. (U.S. 6,552,436) as applied to claim 78 and further in combination with Tung (U.S. 6,681,982).

11. The modified structure of Ogura and Burnette disclose a solder cap, but does not disclose the material being either for example tin, lead or alloys.

12. Tung (Fig 3B) teaches a solder cap comprising an alloy of lead and tin.

13. It would have been obvious to one of ordinary skill in the art to form the cap of a tin lead alloy in order to provide a solder cap as required by Ogura (Col. 4, Lines 13-15).

14. Claims 83 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura (U.S. 6,706,554) and Burnette et al. (U.S. 6,552,436) as applied to claim 78 and further in combination with Lynch (U.S. 5,872,404).

15. Neither Ogura nor Burnette disclose titanium, metallic layer positioned between a pillar and pad.

16. Lynch (Fig 4) utilizes titanium, metallic layer (20) positioned between a pillar (25) and pad (14).

17. It would have been obvious to one of ordinary skill in the art to incorporate a titanium, metallic layer between the pillar and pad of the modified structure of Ogura and Burnette in order to prevent diffusion as taught by Lynch (Col. 3, Lines 34-36).

18. Claims 89 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura (U.S. 6,706,554) and Burnette et al. (U.S. 6,552,436) and with Miyazaki (U.S. 2001/0048166) as applied to claim 85 and further in combination with Tung (U.S. 6,681,982).

19. The modified structure of Ogura, Burnette and Miyaki disclose a solder cap, but does not disclose the material being either for example tin, lead or alloys.

20. Tung (Fig 3B) teaches a solder cap comprising an alloy of lead and tin.

21. It would have been obvious to one of ordinary skill in the art to form the cap of a tin lead alloy in order to provide a solder cap as required by Ogura (Col, 4, Lines 13-15).

22. Claim 90 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogura (U.S. 6,706,554), Burnette et al. (U.S. 6,552,436) and Miyazaki (U.S. 2001/0048166) as applied to claim 85 and further in combination with Lynch et al. (U.S. 5,872,404).

23. Neither Ogura, Burnette nor Miyaki disclose a titanium, metallic layer positioned between a pillar and pad.

24. Lynch (Fig 4) utilizes titanium, metallic layer (20) positioned between a pillar (25) and pad (14).

25. It would have been obvious to one of ordinary skill in the art to incorporate a titanium, metallic layer between the pillar and pad of the modified structure of Ogura, Burnette and Miyaki in order to prevent diffusion as taught by Lynch (Col. 3, Lines 34-36).

***Response to Arguments***

26. Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.

**Conclusion**

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to James M. Mitchell whose telephone number is (571) 272-1931. The examiner can normally be reached on M-F 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jmm  
March 17, 2005

  
**ERIK KIELIN**  
**PRIMARY EXAMINER**